

THREE-LINED FIG-TREE BORER

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INTRODUCTION

The adult three-lined fig-tree borer (*Ptychodes trilineatus* L.) is a large, longitudinally striped, long-horned, wood-boring beetle of the family Cerambycidae, which does considerable damage to fig trees (*Ficus carica*) in the Southern States by boring into the larger branches and trunks.¹

This insect occurs throughout the southern United States from Florida to Houston, Texas, and from South Carolina to the Gulf. It has also been reported from parts of Mexico, British Honduras, Nicaragua, Costa Rica, Guatemala, Panama, and the West Indies, Colombia, and Venezuela, South America, and Tahiti, Oceania. The adult beetle causes some injury by feeding upon the fruit, leaves, and bark of fig trees and by ovipositing in the bark, but the greatest amount of damage is done by this insect while in the larval state. The larva is a white, flat-headed borer, or sawyer, which mines its way into the larger branches and trunks of the trees (Pl. 37), where it feeds upon the wood for from three months to more than one year, and reaches a length of nearly 2 inches, before changing to the pupa.

INJURIOUSNESS

The borers live in dry as well as in green wood, and specimens have lived for two or three weeks in other woods than the fig. Two larvae from one lot under observation ate their way out of their blocks of fig wood and into the top of a cypress table, where they tunneled for 2 and 3 inches, respectively, and completed the transformation to the adult stage. They appear to prefer wood which is partly dead and has lost some of its sap to healthy green wood, and therefore attack principally those trees or branches which are injured or diseased. Any injury, however, such as the breaking of a large limb, may invite the deposition of many eggs by the adult beetle, and the branch will then be killed by the borers. The first attack will, furthermore, generally be followed by others until the whole tree becomes involved and is finally killed by the insect.

Favorite points of attack are near wounds made by the breaking of large limbs, untreated saw cuts, splitting of the trunk, the knots formed

¹ Several other borers also attack fig trees in the Southern States—for example, *Leptostylus biustus* Lec., *Goes* sp., *Stephanoderes* sp., and *Ataxia crypta* Say—and are found working in the same trees with *Ptychodes trilineatus*.

in the branches by fig canker,¹ injuries in the bark, etc. For example, a fig tree on the laboratory grounds at New Orleans, which through faulty pruning a comparatively light wind had caused to split down through the head, became so severely infested that it was estimated there were more than 1,700 borers in it at one time. Another fig tree which had been perfectly healthy and free from borers became severely infested in the trunk soon after the bark had been injured by a mercurial band applied to keep out ants. Still another healthy tree first became infested after a windstorm had broken off one of the larger branches, the eggs all being deposited in the branch from which it was broken, not far from the wound.

Every one of the six or eight injured or diseased fig trees on the laboratory grounds at New Orleans became heavily infested with borers, whereas not a single egg or borer could be found during three seasons in any of the 8 or 10 well-formed, healthy trees growing near them in the same yard. It may therefore be set down as a practically infallible rule that if the fig trees are kept in a thriving healthy condition, they will not be subjected to severe attacks, and may escape any injury whatever from the three-lined fig-tree borer.

BIOLOGY AND HABITS

THE EGG

DESCRIPTION AND PLACE WHERE FOUND

The egg (Pl. 35, A) is an elongate, nearly cylindrical, pure white to faintly yellowish or greenish object, ranging from 0.026 inch (0.66 mm.) to 0.039 inch (1 mm.) broad, from 0.128 inch (3.25 mm.) to 0.144 inch (3.66 mm.) long, being on an average 0.036 inch (0.916 mm.) broad and 0.138 inch (3.52 mm.) long. The shell is often more or less distinctly patterned like the grain of the fig wood in which the egg is deposited.

The eggs are deposited by insertion into the bark of the larger branches and trunk, thus being completely hidden from view and protected by the bark. They are usually deposited near wounds or decaying spots in the bark, or in limbs which have been cut or broken. They are even deposited in large branches which have been removed from the tree. They are seldom or never found in perfectly sound, healthy bark, a fact of importance in controlling the borer. The eggs usually occur singly, but sometimes two, three, or five are found together.

INCUBATION

The incubation period of eggs of the fig-tree borer does not vary greatly, at least in the period from May to September, when most eggs are developing. The maximum time required for the eggs to develop, as recorded in the season of 1914 and 1915, was 8 days, the minimum 3 days, the

¹ EDGERTON, C. W. DISEASES OF THE FIG TREE AND FRUIT. La. Agr. Exp. Sta. Bul. 126, p. 10-12, pl. 5. 1911.

average being approximately 5.6 days. The comparative regularity of the time required for incubation appears to be due to the relative uniformity of temperature and humidity prevailing in the bark tissues of the fig trees. The complete record on the incubation of eggs of the fig-tree borer at New Orleans, La., for the seasons of 1914 and 1915 is given in Table I.

TABLE I.—Incubation period of eggs of the three-lined fig-tree borer, New Orleans, La., 1914 and 1915

Number of eggs in the record.	Date of dep- osition.	Date of hatching.	Incuba- tion time.	Number of eggs in the record.	Date of dep- osition.	Date of hatching.	Incuba- tion time.
	1914.	1914.	Days.		1915.	1915.	Days.
9.....	July 2	July 5	3	2.....	June 1	June 7	6
17.....	July 4	July 9	5	2.....	do.....	June 8	7
5.....	do.....	July 11	7	1.....	June 2	June 7	5
6.....	July 27	Aug. 1	5	3.....	do.....	June 6	4
9.....	July 28	Aug. 3	6	1.....	do.....	June 8	6
6.....	July 31	Aug. 4	4	3.....	June 3	do.....	5
2.....	do.....	Aug. 5	5	4.....	June 7	June 11	4
4.....	do.....	Aug. 6	6	5.....	do.....	June 12	5
1.....	do.....	Aug. 8	8	7.....	do.....	June 13	6
6.....	Aug. 1	Aug. 5	4	8.....	June 9	do.....	4
1.....	do.....	Aug. 6	5	10.....	June 11	June 16	5
7.....	Aug. 3	Aug. 7	4	2.....	do.....	June 18	7
1.....	do.....	Aug. 8	5	3.....	June 12	June 15	3
7.....	Aug. 11	Aug. 14	3	7.....	do.....	June 18	6
1.....	do.....	Aug. 16	5	11.....	June 14	do.....	4
	1915.	1915.		6.....	June 15	June 20	5
9.....	May 24	May 31	7	13.....	June 18	June 23	5
1.....	do.....	June 1	8	2.....	do.....	June 25	7
1.....	May 25	June 2	8	5.....	June 20	do.....	5
8.....	May 26	June 1	6	7.....	June 26	June 30	4
1.....	do.....	June 2	7				
3.....	May 29	June 5	7				
1.....	May 30	June 6	7				
2.....	do.....	June 5	6				
				210			
					Maximum.....		8
					Minimum.....		3
					Average.....		5.6

HATCHING

When the development of the egg is completed and the larva ready to issue it chews its way out through the upper end of the eggshell. The larvæ generally feed at first upon the eggshell, sometimes devouring nearly all of it before tunneling into the bark layers.

LARVA OR BORER

DESCRIPTION

The larva, or borer proper (Pl. 35, B, C), is white to cream-colored, a legless grub, varying in length from about 0.125 inch (3 mm.) just after issuance from the egg to about 1.7 inches (43 mm.) when fully grown. It is broadest across the first thoracic segment, tapering gradually from the latter to the tip of the abdomen. The head is subrectangular, its sides converging posteriorly. The anterior border has a small 4-jointed appendage at each side of the base of the mandible. The anterior

border and mandibles are dark brown to nearly black, and the posterior part of the head clear light amber. The anterior and lateral borders of the first body segment are of a shining, yellowish brown, and the posterior half velvety-brown; the remaining segments are creamy-white throughout. The dorsal and ventral surfaces of abdominal segments are tuberculate, the minute dorsal tubercles being arranged in four irregular rows, forming two irregular oval rings, one within the other. The last segment bears on its ventral surface a small group of amber-colored, chitinous spines.

Mr. F. C. Craighead, of the Bureau of Entomology, who has especially studied the classification of the larvæ of the Cerambycidae, gives the following characters for distinguishing the larvæ of *Ptychodes trilineatus* from others of that family:

Sides of head converging posteriorly; dorsal surface of prothorax vellured on posterior half; dorsal and ventral surfaces of abdominal segments tuberculate, tubercles on dorsal surface arranged in four irregular rows.

These characters will distinguish larvæ of the subfamily Lamiinae, to which *Ptychodes trilineatus* belongs, from those of the other subfamilies. The presence of a small group of chitinous spines, on the ventral surface of the last abdominal segment, distinguishes the larva of the three-lined fig-tree borer from that of other species of the genus *Ptychodes*.

MOLTING AND GROWTH

The number of instars, or substages in the growth of the larva of the three-lined fig-tree borer, is variable and the occurrence of the molts irregular. A little more than half the specimens under observation molted only five or six times before transforming to the pupa, about one-fourth of them made the transformation after the eighth molt, and the remaining fourth after the fourth, seventh, ninth, or tenth molts. It is only rarely that as many as 10 molts occur in the larva. The insect will sometimes molt twice in close succession after being cut or otherwise injured, the extra molting being apparently a protective measure in such cases. In molting, the head cast splits slightly along the median ventral line, separates from the body integument, and is slipped off whole. The skin is slowly pushed back over the tip of the abdomen.

There is also a wide variation in the duration of the larval instars. Each of the first three instars may be completed in anywhere from 3 days to about 40 days, while each of the succeeding ones requires from about one week, as a minimum, to between 50 to 60 days, as a maximum, for those specimens which complete their growth in a single summer. With larvæ which live through the winter from one season to the next, the later stages of growth will be much longer, requiring 5 or 6 months. The average duration of the different substages in the growth of the larva was as follows: Instar I, 8 days; II, 9 days; III, 12 days; IV, 16 days; V, 23 days; VI, 26 days; VII, 38 days for those specimens not passing and 5 months for those passing the winter in the larval stage;

VIII, 34 days for specimens completing their growth during the same summer in which they issued, and $6\frac{1}{2}$ months for larvæ living over the winter; IX, 30 days for summer specimens, and $5\frac{1}{2}$ months for those living through the winter as larvæ.

LENGTH OF LIFE AND HABITS

When the young borer issues from the egg, it mines its way along through the bark for several days. It then usually tunnels into the solid wood and often eats its way to the very heart of the branch. It lives and feeds in this manner, packing the burrow tightly behind it with "sawdust," for from about 2 to 15 months. About two-thirds of the borers observed completed this stage in the season in which the eggs from which they issued were deposited, while the remaining third lived through the winter, pupating the following season. Those borers completing the larval life in one season required approximately from 2 to $4\frac{1}{2}$ months, the average larval life of the single season specimens being about 3 months. The overwintering borers required from $7\frac{1}{2}$ to 15 months to complete the larval life, the average life in the wood being $11\frac{1}{3}$ months. As the borers are feeding during most of this long period, and reach a size of 1.5 to 2 inches long and nearly 0.25 inch broad, it is seen that even a single insect can cause a great deal of injury. The records on the duration of the larval stage are given in Table II.

TABLE II.—Duration of the larval stage of the three-lined fig-tree borer, New Orleans, La., 1915-16

No.	Date of issuance.	Date of pupation.	Duration of larval stage.	No.	Date of issuance.	Date of pupation.	Duration of larval stage.
			Months.				Months.
1.....	May 21, 1915	Sept. 29, 1915	4.33	37.....	June 18, 1915	Sept. 7, 1915	2.75
2.....	do.....	Aug. 28, 1916	15	38.....	do.....	Sept. 18, 1915	3
3.....	June 1, 1915	Mar. 31, 1916	10	39.....	do.....	Sept. 7, 1915	2.75
4.....	June 2, 1915	Oct. 9, 1915	4.25	40.....	do.....	Sept. 29, 1915	3.5
5.....	June 1, 1915	Aug. 27, 1915	3	41.....	do.....	do.....	3.5
6.....	June 5, 1915	Sept. 29, 1915	4	42.....	do.....	Aug. 28, 1916	12
7.....	do.....	July 10, 1916	13	43.....	do.....	Aug. 31, 1915	2.5
8.....	June 7, 1915	Sept. 7, 1915	3	44.....	do.....	May 15, 1916	11
9.....	June 8, 1915	July 10, 1916	13	45.....	do.....	Mar. 31, 1916	9.5
10.....	June 7, 1915	Sept. 29, 1915	3.5	46.....	do.....	Sept. 18, 1915	3
11.....	June 6, 1915	Aug. 27, 1915	2.66	47.....	do.....	Aug. 31, 1915	2.5
12.....	June 8, 1915	Sept. 7, 1915	3	48.....	June 20, 1915	Mar. 31, 1916	9.5
13.....	do.....	Sept. 13, 1915	3.25	49.....	do.....	Sept. 18, 1915	3
14.....	June 11, 1915	Sept. 7, 1915	3	50.....	do.....	Mar. 10, 1916	8.6
15.....	do.....	Mar. 31, 1916	9.5	51.....	June 23, 1915	Oct. 9, 1915	3.5
16.....	do.....	do.....	9.5	52.....	do.....	Aug. 28, 1916	14
17.....	June 12, 1915	Aug. 17, 1915	2.25	53.....	do.....	Oct. 16, 1915	4
18.....	do.....	Aug. 28, 1916	14.5	54.....	do.....	Sept. 7, 1915	2.5
19.....	do.....	Aug. 17, 1915	2.25	55.....	do.....	Sept. 18, 1915	3
20.....	June 11, 1915	Aug. 27, 1915	2.5	56.....	do.....	Oct. 16, 1915	4
21.....	do.....	Sept. 18, 1915	3.25	57.....	do.....	June 12, 1916	11.6
22.....	do.....	Aug. 27, 1915	2.5	58.....	do.....	Oct. 9, 1915	3.5
23.....	June 13, 1915	Mar. 31, 1916	9.5	59.....	do.....	do.....	3.5
24.....	do.....	Aug. 27, 1915	2.5	60.....	June 25, 1915	Aug. 19, 1915	1.8
25.....	do.....	do.....	2.5	61.....	do.....	Sept. 29, 1915	3.25
26.....	do.....	Aug. 28, 1916	14.5	62.....	June 30, 1915	do.....	3
27.....	do.....	Aug. 27, 1915	2.5	63.....	do.....	Oct. 16, 1915	3.5
28.....	do.....	Oct. 25, 1915	4.5	64.....	do.....	Feb. 17, 1916	7.5
29.....	do.....	May 15, 1916	11	65.....	do.....	Sept. 29, 1915	3
30.....	June 16, 1915	Sept. 18, 1915	3.25	66.....	do.....	Aug. 31, 1915	2
31.....	do.....	Sept. 29, 1915	3.5	67.....	July 2, 1915	Mar. 31, 1916	9
32.....	do.....	May 15, 1916	11				
33.....	do.....	Aug. 19, 1915	2		Maximum.....		15
34.....	do.....	Aug. 28, 1916	14.5		Minimum.....		1.8
35.....	June 15, 1915	Aug. 19, 1915	2.25		Average.....		5.6
36.....	do.....	Sept. 7, 1915	2.75				

When the larva is ready for pupation, it tunnels its way to a point near the surface, enlarges the cavity slightly, and completely surrounds itself with a sort of cell, or cocoon, composed of shreds and pellets of wood, tightly glued together. After making the cocoon, the larva ceases feeding, shrinks slightly, and molts, transforming to the pupal stage.

RESISTANCE OF THE LARVA TO INJURIES

While the larva of the three-lined fig-tree borer is soft bodied, and easily injured when removed from the protecting fig wood, its resistance to knife cuts and similar mechanical injury is great, as specimens cut so severely as to cause the loss of a considerable quantity of body fluid will often entirely recover and complete their development. Thus, one specimen which was cut nearly in two and had lost much of the body fluid recovered and reached the adult stage in the usual time, as did several others with injuries only slightly less severe. On one occasion, when a large-sized borer was chewed nearly in two and lost one of its mandibles as the result of meeting another borer in the wood, both wounds completely healed and the insect survived for more than a month. During this time the body cavity was closed by a thin, transparent membrane. The borer was, of course, unable to feed. A glossy black scab usually forms over a cut or abrasion in the larval skin. Infections often occur through abrasions, and this was the principal cause of the loss of injured specimens in the rearing work.

THE PUPA

DESCRIPTION

The pupa (Pl. 35, D, E) on first emerging is creamy-white, but soon takes on more yellow and develops a brown shading on the feet, the tips of the antennæ, and the mouth parts. As development progresses the eyes and mandibles turn amber-brown, then the prothorax, head, antennæ, sides of abdomen, and tips of wings take on similar coloring. The size varies slightly in the sexes and in different specimens of the same sex. The length ranges from approximately 0.78 to 1.06 inches (20 to 27 mm.), with an average of approximately 0.94 inch (24.06 mm.); the breadth of the thorax from approximately 0.19 to 0.23 inch (5 to 6 mm.), with an average of approximately 0.21 inch (5.5 mm.); that of the abdomen from about 0.22 to 0.29 inch (5.75 to 7.50 mm.), with an average of approximately 0.23 inch (6.5 mm.). The antennæ are 11-jointed but, owing to the fusion of the second and third joints, there appear to be only 10. They are directed backward along the sides of the body, the last seven joints resting curled together against the wing. The wings extend backward and downward under the abdomen, their tips reaching almost to the hind margin of the second abdominal segment. On each side of the dorsum of the prothorax are 16 small brown setæ or hairs arranged as follows: 1 long hair near the middorsal line near the front margin, 2 loose patches of 5 smaller hairs on the middle portion of each half of the pronotum.

tum, the rear patch being opposite its lateral marginal projection, the remaining 5 hairs set irregularly along the middorsal line and the hind margin of the pronotum. On the mesonotum are about 25 similar hairs so arranged as to form a V, the point directed toward the tip of the abdomen. A similar but larger V occurs on the mesothorax. On the dorsum of the first two abdominal segments is a thick brush of minute brown hairs, divided in the middle by the median dorsal line, consisting of the following numbers of hairs: On segment 3, about 44; segment 4, about 22; segment 5, about 19; segment 6, about 16; and segment 7, about 10. A group of similar setæ occurs at the base of each antenna and on the labrum and clypeus.

The life of the pupa is passed entirely within the sawdust cell constructed by the borer in its tunnel in the wood. When the pupal skin has been cast and the newly formed adult has hardened somewhat, it chews a circular hole through the bark and emerges into the outer air. The exit holes of the adult beetle are almost perfectly circular, and the occurrence of such holes in trunk and limbs indicates the escape of adults, not the entrance of larvæ.

DURATION OF THE PUPAL STAGE

The duration of the pupal stage, like that of the larval stage, is quite irregular. The extreme minimum duration in the specimens under observation was 5 days, but this occurred only in two cases. The extreme maximum was 73 days. The average duration of the pupal stage for all of the 70 specimens observed through that stage was 24 days. The complete records on the duration of the pupal stage are given in Table III.

TABLE III.—Duration of the pupal stage of the three-lined fig-tree borer, New Orleans, La., 1914, 1915, and 1916

No.	Date of pupation.	Date of emergence.	Duration of pupal stage.	No.	Date of pupation.	Date of emergence.	Duration of pupal stage.
	1914.	1914.	Days.		1915.	1915.	Days.
1.....	Sept. 1	Sept. 15	14	16.....	Aug. 17	Sept. 6	20
2.....	do.....	Sept. 22	21	17.....	do.....	Aug. 31	14
3.....	do.....	Sept. 14	13	18.....	Aug. 19	do.....	12
4.....	do.....	Sept. 22	21	19.....	do.....	do.....	12
5.....	do.....	Sept. 15	14	20.....	Aug. 27	Sept. 13	17
6.....	Sept. 9	Sept. 29	20	21.....	do.....	do.....	17
7.....	do.....	Sept. 22	13	22.....	do.....	do.....	17
8.....	do.....	do.....	13	23.....	do.....	do.....	17
9.....	do.....	Sept. 15	6	24.....	do.....	do.....	17
10.....	do.....	Sept. 22	13	25.....	do.....	Sept. 16	20
11.....	Sept. 29	Oct. 16	17	26.....	Aug. 31	do.....	16
	1915.	1915.		27.....	do.....	Sept. 12	12
12.....	Apr. 24	May 15	21	28.....	do.....	do.....	12
13.....	May 25	June 5	11	29.....	Sept. 7	Sept. 16	9
14.....	May 28	June 16	19	30.....	do.....	Sept. 18	11
15.....	Aug. 17	Sept. 6	20	31.....	do.....	do.....	11
				32.....	do.....	do.....	11

TABLE III.—Duration of the pupal stage of the three-lined fig-tree borer, New Orleans, La., 1914, 1915, and 1916—Continued

No.	Date of pupation.	Date of emergence.	Duration of pupal stage.	No.	Date of pupation.	Date of emergence.	Duration of pupal stage.
	1915.	1915.	Days.		1915.	1915.	Days.
33.....	Sept. 7	Sept. 18	11	53.....	Oct. 16	Nov. 8	23
34.....	do.....	do.....	11	54.....	do.....	do.....	23
35.....	do.....	do.....	11	55.....	do.....	Nov. 12	27
36.....	Sept. 18	Sept. 30	12	56.....	Oct. 25	Nov. 15	21
37.....	do.....	do.....	12		1916.	1916.	
38.....	do.....	Sept. 23	5	57.....	Feb. 17	Mar. 31	42
39.....	do.....	do.....	5	58.....	Mar. 10	May 16	67
40.....	do.....	Oct. 4	16	59.....	Mar. 31	June 12	73
41.....	do.....	do.....	16	60.....	do.....	do.....	73
42.....	Sept. 29	Oct. 13	14	61.....	do.....	do.....	73
43.....	do.....	Nov. 15	47	62.....	do.....	do.....	73
44.....	do.....	Oct. 19	20	63.....	do.....	do.....	73
45.....	do.....	Oct. 14	15	64.....	do.....	May 15	45
46.....	do.....	Oct. 18	19	65.....	do.....	May 25	55
47.....	do.....	Oct. 16	17	66.....	Apr. 16	May 15	29
48.....	do.....	Oct. 24	25	67.....	May 15	July 10	56
49.....	do.....	Oct. 18	19	68.....	do.....	do.....	56
50.....	Oct. 9	Oct. 27	18	69.....	July 10	July 26	16
51.....	do.....	Nov. 1	23	70.....	do.....	Aug. 28	49
52.....	do.....	Nov. 3	25				
Maximum.....							73
Minimum.....							5
Average.....							24

THE ADULT

DESCRIPTION

The adult three-lined fig-tree borer (Pl. 36) is a long-horned beetle of the family Cerambycidae. The body is elongate, the females measuring from about 0.86 inch (22 mm.) to 1.1 inches (28 mm.) long from the vertex to the tip of the elytra, the average length being approximately 1 inch (25.5 mm.). The greatest width of the prothorax of the female is, on an average, about 0.2 inch (5.25 mm.), of the metathorax, across the base of the wing covers, about 0.27 inch (7 mm.).

The male varies from about 0.55 inch (14 mm.) to 0.82 inch (21 mm.) in length, being, on an average, about 0.75 inch (19.1 mm.) long. The prothorax is, on an average, about 0.16 inch (4.08 mm.), and the metathorax 0.21 inch (5.4 mm.) wide. The antennæ are 11-jointed, nearly 2½ times the length of the body (average 2.48 inches). The vertex is deeply and narrowly channeled, the channel extending in a distinct suture for the length of the head. The eyes are nearly divided, the lower lobe much broader than the upper. Prothorax cylindrical, narrowest in front. The legs are slender, the fore pair the longest. The body is broadest across base of the elytra, which taper toward their tips and end in a short sutural spine. The first and fifth ventral segments are longer than the intermediate ones. The general coloring of the dorsum,

owing to a dense covering of fine appressed hairs, is brown and white in longitudinal stripes. Two broad brown stripes, punctuated with minute orange tufts in longitudinal rows, extend from antennæ to the tips of the elytra. A median scalloped white to yellowish stripe extends the length of the dorsum, ending abruptly at the anterior margin of the prothorax, and two similar lateral stripes extend from near the tips of the elytra along their margins to the bases of the antennæ. The integument beneath the tomentum is a dark amber-brown, finely punctate. The surface color of the antennæ, legs, and underside of the body is dark gray to brown. When first emerged, the general color is a very light brown to cream-yellow, with very faint white stripes.

FOOD OF THE ADULT

The adult beetles feed upon the tender bark of the smaller fig stems, and in captivity, when fed with such stems with the leaves attached, have eaten freely of the leaves. During the fruiting season they also feed to a considerable extent upon ripe and nearly ripe figs. They have been kept in captivity for several months, by feeding them leaves, fruit, and bark of the fig tree.

DURATION OF ADULT LIFE

The longevity of the adult three-lined fig-tree borer as determined upon 24 specimens in 1914-15 ranged from a minimum of about 2.5 months (75 days) to about 7.25 months (222 days). About one-fourth of the specimens lived 3 months or slightly longer, and the average length of life of all was 3.7 months. The complete records are given in Table IV.

TABLE IV.—Longevity of adults of the three-lined fig-tree borer, New Orleans, La., 1914-15

Number of specimens.	Date of emergence.	Date of death.	Duration of adult life.	
			Days.	Months.
6.....	1914. June 22	1914. Sept. 5	75	2.5
2.....	do.....	Sept. 14	84	2.75
1.....	do.....	Nov. 2	133	4.33
5.....	do.....	Sept. 22	92	3
3.....	do.....	1915 Jan. 21	213	7
1.....	do.....	Jan. 30	222	7.25
1.....	Sept. 22	do.....	130	4.33
1.....	1915. Apr. 23	July 31	99	3.25
1.....	do.....	Sept. 14	144	4.75
1.....	May 6	July 29	84	2.75
1.....	May 15	Sept. 14	122	4
1.....	May 6	Sept. 1	118	3.75
Total, 24.				
Maximum.....				7.25
Minimum.....				2.5
Average.....				3.75

OVIPOSITION

In ovipositing, the insect usually stands with the body parallel to the axis of the trunk or branch, with the head toward its upper extremity, and makes a double transverse incision in the bark with the mandibles. The ovipositor is then inserted into one of the incisions, and the egg thrust downward and into the bark to a depth of from 0.125 to 0.25 inch. As a rule a cut is made in the bark for every egg, but sometimes two or three, and rarely as many as five eggs are deposited side by side. The "egg bite," consisting of two small, transverse slits made side by side in the bark by the mandibles, is usually the only external evidence of the presence of eggs; but on rare occasions the eggs are inserted so near the surface as to be visible as slight elevations in the bark.

The preoviposition period, or the time elapsing between emergence and oviposition, ordinarily varied from 8 to 16 days; but in a few specimens it was nearly a month. Most of the specimens required 8 days. The females also lived from 8 to 26 days after they had ceased to deposit eggs, but this was in the fall and winter when cool weather probably retarded oviposition.

NUMBER OF EGGS DEPOSITED

A complete record of oviposition was obtained from nine insects in 1914 and 1915. Three of the specimens deposited approximately 101 eggs each at the average rate of 1.5 eggs each per day; three more specimens deposited approximately 184 eggs each at the average rate of 1 egg each per day, and a seventh insect deposited 110 eggs at the rate of 1.4 eggs per day. The remaining two females deposited approximately 261 eggs each at the average rate of 2.4 eggs each per day. The oviposition record is given in Table V.

TABLE V.—Oviposition record of the three-lined fig-tree borer, New Orleans, La., 1914 and 1915

Number of specimens.	Date of beginning oviposition.	Date of ending oviposition.	Number of days of oviposition	Number of eggs deposited.
	1914	1914		
3.....	June 30	Sept. 4	66	302
3.....	June 30	Dec. 26	179	553
	1915	1915		
2.....	May 22	Sept. 6	107	523
1.....	Sept. 29	Dec. 15	77	110

From the foregoing it is seen that a single female three-lined fig-tree borer will deposit from 100 to 184 eggs in the course of her life at an average rate of from 1 to 2.4 eggs per day.

SEASONAL HISTORY

Adult beetles of the three-lined fig-tree borer first begin to emerge in March, but it is not until May that emergence is well under way, with the beetles appearing rapidly. The largest number of beetles appear in September, and the last specimens emerge in November or early December. These late-emerging beetles will deposit eggs on the warmer days of winter till at least as late as January 24. Fewest eggs are deposited in the months from February to April, inclusive, and the greatest number from May to September, inclusive. There is no true hibernation period in the latitude of New Orleans, but there is a period of comparative inactivity during the months from December to February, inclusive, during which, however, a slight amount of oviposition occurs, and eggs, larvæ, pupæ, and adults may be found in the fig wood.

The life cycle, from egg to adult, was passed by 54 specimens, or about five-sixths of the number observed through all stages, in the same season in which the eggs were deposited, their average life cycle being 3.5 months. Ten, or about one-sixth of them, lived through from May to June of one year to May and June of the following year, their average life cycle being 11.5 months. The generations are irregular, the hatch of the eggs deposited in the months from March to May reaching the adult state in the months from June to November, the hatch of a majority of those deposited in June and July becoming adults in the months from August to November, inclusive, and the remainder from March to June of the following year.

CONTROL OF THE BORER

Since the adult three-lined fig-tree borer does not as a rule oviposit in the perfectly sound limbs or trunk of the healthy trees, the most important measure of control is to keep the trees in the healthiest condition possible. The larger branches, 1 inch in diameter and upward, and the trunk are the parts particularly susceptible to attack.

Care should be taken to avoid bruising the bark or breaking limbs in cultivating and in picking the fruit, and the trees should be shaped to strengthen them as far as possible against breaking or splitting by heavy winds. The work of such diseases of the limbs as fig-canker and fig-limb blight should also be prevented as far as possible.

When a branch is accidentally broken, it should be immediately cut off smooth at its juncture with the larger branch or trunk and the wound painted with a mixture of five parts of coal tar and one part of creosote. At least a second and possibly a third coat should be applied when the preceding coat is dry.

It is important to prevent the first branch of a tree from becoming infested, as one infested and dying branch will invite further attacks

upon the trees. When a branch has become infested, it should be removed and burned, as the borers will complete their development even in perfectly dead and dry wood and later infest other trees. Fig-wood prunings should always be destroyed, and never allowed to remain long in or near the orchard.

Freezing of the bark is likely to be followed by borer attack in the branches affected, and such branches should therefore be cut off and the surface of the cut painted as above recommended. When the bark becomes diseased or bruised, the affected area should be removed with a sharp knife, cutting square across to the sound wood, and coating with a protective paint so the bark will heal perfectly.

Trees already heavily infested with borers in the trunk, may as well be at once cut down and every scrap burned, as it will be practically impossible to save them and they will be a source of infestation and a menace to the healthier trees. Trees which are split through the head, those which are in a dying condition from any cause, and the volunteer trees which so persistently spring up from the roots of some varieties of older fig trees grown in southern Louisiana, should also be cut down and burned.

While it is best, where the infestation occurs only in certain branches, to remove the infested branches entire, the borers may be dug out of highly prized individual trees if the infestation has not progressed too far and its area is limited. Some good may also be accomplished, in such cases, by destroying the eggs with a knife or an awl. It would first be necessary, however, to become familiar with the appearance of the egg punctures and eggs. Yard trees should first of all, of course, be kept in a healthy condition in order to prevent attack by the borers. Oviposition may largely be prevented, in the case of a few yard trees, by insheathing the trunk and larger branches with wire netting. The screen would have to be kept in place practically throughout the year.

The borers in some cases may be killed by injecting carbon bisulphid into the tunnels and plugging the openings with putty, but this method is impracticable where the infestation is severe and well advanced.

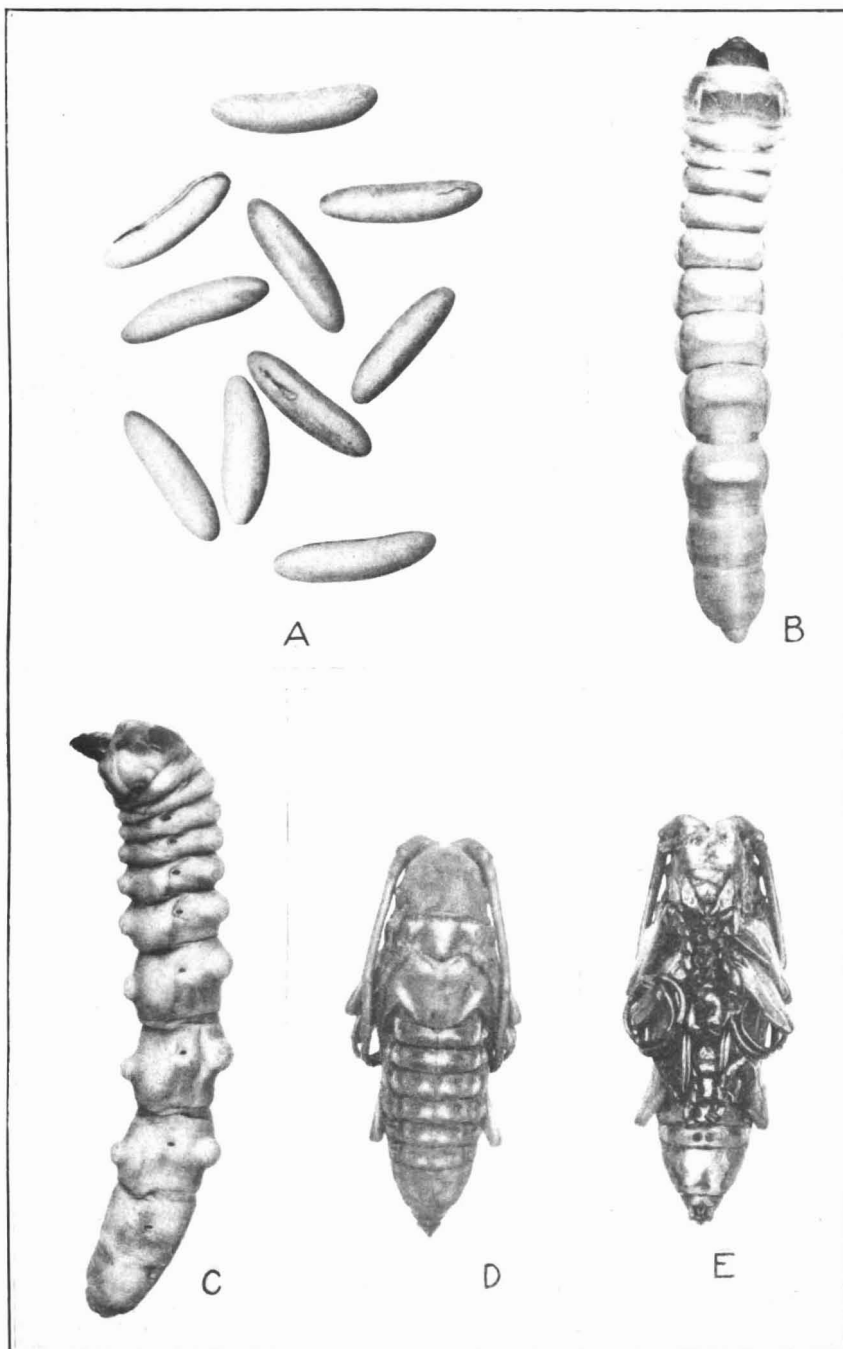
PLATE 35

Ptychodes trilineatus: Immature stages

A.—Egg. $\times 8$.

B, C.—Full-grown larva. $\times 2$.

D, E.—Pupa. $\times 2$.



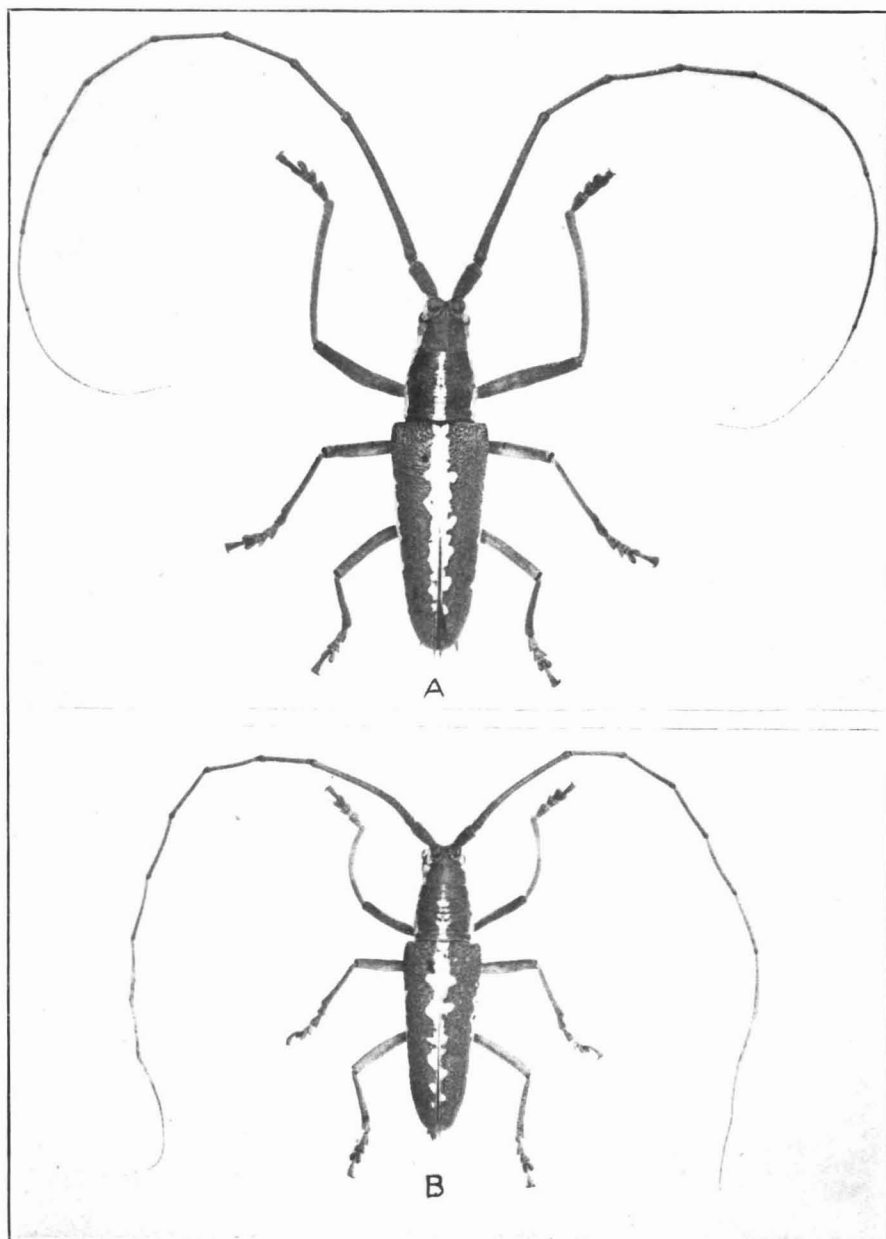


PLATE 36

Ptychodes trilineatus: Adult

A.—Female. $\times 2$.

B.—Male. $\times 2$.

PLATE 37

Ptychodes trilineatus:

- A.—Feeding injury of the larva.
- B.—Dead fig tree, showing injury by the three-lined fig-tree borer and other boring insects.

